

## Point of Care Glucose Accuracy in Surgical Patients under Anesthesia

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**Background:** Capillary glucose monitoring in critically ill patients, especially among critically ill patients that may have peripheral hypoperfusion, remains controversial. Recently, the Nova StatStrip® point-of-care (POC) glucose meter was cleared by the Federal Drug Administration (FDA) for use in hospitalized patients that are critically ill or receiving intensive medical treatment using venous or arterial whole blood. Diabetic patients undergoing surgical procedures who are under general anesthesia are a unique patient population in which the accuracy of capillary glucose testing is unknown. General anesthesia is known to affect blood pressure, tissue perfusion, and patient temperature. Patient positions during the surgery could also affect peripheral (finger) limb perfusion. All of these factors could result in disparate fingerstick capillary sample glucose concentrations compared to venous or arterial sampling. Therefore, we tested the accuracy of whole blood capillary glucose testing compared to laboratory whole blood testing from arterial lines in patients undergoing surgical procedures.

**Methods:** Two hundred non-consecutive patients (age >18) scheduled for a thoracic-vascular or neurology procedure were prospectively consented with written informed consent. Study requirements included a pre-operative hemoglobin > 10 mg/dL and arterial line placement during surgery. One capillary sample and one arterial whole blood (in 3 mL lithium heparin syringe) sample were collected at two time points: within 30 minutes of arterial line placement and again at least 60 minutes after surgical incision. Testing performed at each time point included (1) a capillary fingerstick sample tested on the Nova StatStrip® glucose meter, (2) an arterial whole blood sample tested on the Nova StatStrip® glucose meter, and (3) an arterial whole blood sample tested in the laboratory on the Radiometer® ABL 90 (reference method). Subject data (temperature, blood pressure, mean arterial pressure, type/dose of drugs including vasopressors and anesthetic agents) was collected electronically with 2-minute resolution. Additional data (hemoglobin, pH, CO<sub>2</sub>, PO<sub>2</sub>) was manually extracted from the Electronic Medical Record. Median (interquartile range, IQR) bias between capillary POC and reference glucose concentration, and median (IQR) bias between arterial POC and reference glucose concentration were calculated.

**Results:** Median bias (IQR) bias between capillary and reference glucose was -4.0 (-8.5 to -0.0) mg/dL; while median (IQR) bias between arterial POC and reference glucose was -5.0 (-9.0 to -1.0) mg/dL (p=0.3934). Ninety-three percent (342/367) of capillary samples and 96% (352/367) of arterial samples met the ISO 15197 guideline for accuracy ( $\pm 15$  mg/dL for reference glucose <100 mg/dL and  $\pm 15\%$  for reference glucose  $\geq 100$  mg/dL). Median bias was not different between the two time points or between lateral and supine patient position. Among clinical variables, only age-adjusted Charleston risk score demonstrated a small but statistically significant relationship to capillary glucose meter bias (p=0.05); and only mean diastolic blood pressure in the 15 minutes before testing (p=0.03) had a significant effect on arterial glucose meter bias. Among laboratory variables, only pCO<sub>2</sub> had a small but significant impact on the relationship between capillary glucose meter and reference glucose (p=0.04) while no variables affects arterial glucose meter bias. Rare (n=5) outliers (glucose meter value > 30 mg/dL different from reference value) were observed for both arterial and capillary glucose meters samples.

**Conclusion:** Rare outliers occur when both arterial and capillary whole blood samples are tested on the Nova StatStrip during surgery. None of the clinical or laboratory variables studied provided a clear explanation for bias observed between glucose meter and reference glucose. Arterial samples tested on the Nova StatStrip® glucose meter did meet the ISO 15197:2013<sup>8</sup> guidelines, while capillary samples just failed to meet these criteria. Caution should be used in using glucose meters to monitor intraoperative glucose, with arterial sampling providing slightly greater accuracy than capillary sampling